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METEOROLOGY.

METEOROLOGICAL FACTORS AND PHENOMENA.

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The Factors which produce our meteorological phenomena are very few, and may, like all other branches of science, be divided and sub-divided into positive and negative, or active and passive. To enumerate them in exact order may be difficult and unimportant.

It matters not whether for the first of our two grand factors we take the Sun or the Earth, for without them both we could not have our peculiar existence or our present meteorological system.

The Sun as the active agent of heat, the generator and sustainer of life, is the active or positive factor, while the Earth is the passive or negative one, yet both are equally important, and in many respects both positive and negative.

But the mere presence of heat or sunshine upon a planetary body will not produce meteorological phenomena. The body must itself be in condition and have certain combinations of elements in order to produce the effect. The heat of a hundred suns concentrated on a non-aqueous body like the Moon would not produce the necessary combinations. In combination with heat we must have water. Such a body as the Moon may, and undoubtedly does have commotions of atmosphere, such as they are, but then all these commotions would not be like those on a body like our earth where water is abundant.

If satellites like the Moon have storms they must be what we would term *dry storms*. The concentrations of heat on certain parts of the Moon must create some disturbance there, but owing to the absence of water whereby an atmosphere is created, the element surrounding the Moon, (ether, if we may so term it—being so subtle and transparent)—though it cause a disturbance, what it may create is not visible to us 240,000 miles away. If there are any storms on the surface of the Moon they must be the result of the movement of dry ether or very light air. There must necessarily be some concentration of heat; some parts of the moon must be hotter than others, and having no moisture to retain heat they must heat and cool rapidly; and it would seem that the points of concentration of heat must change from place to place, at least that the atmosphere, such as it is, of the cooler reverse side must be moved toward those portions where the heat of the Sun is concentrated and that this must establish currents from the cold to the hot and from the hot to the cold.

This idea assumes that the Moon must have an atmosphere, while science

tells us that the Moon has no atmosphere, but it would seem before we decide the point that we must first determine what atmosphere is. It is not necessary that the Moon have an atmosphere like the earth in order to be recognized as having an atmosphere.

But for the presence of water the Earth would have no more atmosphere than the Moon, so atmosphere in the sense as generally understood must be the product of moisture or something resulting therefrom. These remarks about the moon may seem a little of a digression, yet they naturally follow when we come to speak of atmosphere.

In this connection some may wonder why the planets and Moon are not considered as factors in our meteorological economy—for the simple reason that they have not the least bearing in the case and therefore are not factors. Nothing but concentration of heat effects the meteorology of the earth, and only the Sun has power in this direction. There is no heat from the stars, therefore no effect. "How about attraction?" some may ask. The reply to this is, no one who would study the weather-map for a season and see for themselves how storms travel would be apt to put any dependence upon the accidental relative position of the stars or other heavenly bodies than the Sun. The storms come from the development and concentration of the clouds and movement of the atmosphere, and neither the stars, planets, nor even the Moon, have any power over this department. The earth is beholden to the Sun and only to the Sun for its meteorological phenomena; it alone is the major factor—the great positive, active force, while the earth in relation to it is the minor-negative, passive power.

The next great factor, or better, factors, for they are really distinctive and peculiar in their results, is the combinations of motions of the earth in space; its daily motion on its axis—its yearly motion about the Sun, and the gradual oscillating motion of its axis which exposes different parts of the Earth's polar axis more directly to the influence of the Sun.

The daily motion of the Earth on its axis exposing every twenty-four hours the surface of the Earth to the heat of the Sun is the factor of all the daily changes; the yearly motion of the Earth about the Sun is combination with the parallelism of the Earth's axis is the factor of the yearly or season changes. The common notion is that the yearly motion of the Earth about the Sun in the only and sole cause of the changes of the seasons, yet but for what science terms the "parallelism of the Earth's axis" in connection there with these changes would not take place, for the Sun shining perpendicular to the Equator would produce a sameness and no variety—all our months would be alike and the habitable portions of the globe would be much reduced, at least for such organisms as at present flourish upon it.

It is said that we are sometimes nearer to the Sun than at others, but the distance is comparatively so infinitesimal that it amounts to little or nothing, and practically would not be noticed. The third motion, the gradual change in the angle of the inclination of the Earth's axis, the oscillation of the poles, whereby the polar axis describes a circle in the heavens of some 25,000 years, is the factor

of decades or cycles, or the changes which are the result of vast periods of time—producing these, at present, gradual climatic changes which cause the surface of the earth near the poles to be more directly exposed to the rays of the Sun.

These last three factors are the general results of the three motions of the Earth in connection with the heat of the Sun. The third motion of the Earth, however, seems to be very little regarded, yet it is as important as the other two which cause the daily and yearly changes of the seasons. The three motions of the earth are best represented by the spinning top, including the state known as “dying out.” It has one (first) motion on its axis; one (the second), along the ground; another (the third) back and forth, which in combination with its rotatory motion causes the upper part, which would correspond to the polar axis of the Earth, to describe a circle in the space above it. This third motion of the Earth at present is very gradual, yet there may have been a time when the change was very sudden, and nothing it would seem would so well account for these peculiar and rapid climatic changes of past periods of the Earth’s history, when the features of the present torrid zone prevailed as far north as Siberia, and were changed so rapidly as to entomb alive the huge mammoth, nothing it would seem would so well account for this phenomenon as a sudden change in the inclination of the Earth’s axis.

The next great factor in our meteorological economy is the concentration of the Sun’s rays along certain paths of the Earth’s surface. These concentrations are always on general lines from the west toward the east and are termed areas of low barometer—*i. e.*, the heat of the Sun concentrating on certain points produces there a rarification of the air, or would-be vacuum which is the agent to establish a current of air toward this point. The water present on the Earth is a latent factor in the case; it not only provides moisture to immediate surroundings but furnishes the material for clouds which are simply suspended moisture and which are ever ready, when formed, for transportation to wherever the prevailing winds may dictate. The concentration of the Sun’s rays producing the area of low-barometer, technically termed “low,” is the agent or power that creates the winds.

All these factors, winds, clouds, motion, conditions for existence, all come through that great agent of heat, the Sun. The minor factors though great in themselves, all depend upon are subordinate to the Sun; and it is only when we come to understand the importance of these minor factors that we can by comparison begin to comprehend the greatness of the major factor and the infinite wisdom that established all the beautiful mechanism of our terrestrial system.

On the surface of the Earth we have the factors high and low thermometer and high and low barometer. The thermometer we know is the register of the heat, and other things being equal, it will be hottest where the Earth receives the most direct influence from the Sun. The belt comprising the torrid zones is warmer than the temperate, and the temperate warmer than the frigid, and it would seem that there would be no exceptions—it would seem at least in the immediate vicinity of the Equator it should be warmer than half way from there to

the poles. It is *generally* or more extensively warmer as we approach the Equator; notwithstanding this, even as far north as 45° there are points where at times it is full as hot as on the Equator and even more disagreeably hot. General, broad-spread temperature, though a powerful factor in our meteorological system, causing vegetation to grow and the Earth to be fruitful, is not a power for the distribution of heat and productiveness. If heat had no other peculiarity than that indicated by the thermometer the Earth would not support such beings as we much beyond the tropics of Cancer and Capricorn. But the meteorological facts of late years have thrown much light upon this department. It has shown to us that what we term the area of "low-barometer," technically called "Low," and caused by the concentration of the Sun's rays, has the power to and does continually travel around the world, on general lines, from the west toward the east. Many people ask, why this is so? Enquiring minds always desire to know the "cause," and it is well they should, but when they will not take the trouble to enquire into the other important causes, in this department, that lead up to and explain this, it does not become them to simply demand the cause of only this prominent phenomenon of meteorology. In all departments of nature we are repeatedly lead up to a *first cause*, every department has its *first cause*, which is established as a fact—a fact that we know as well as we know that the Earth is suspended and moves in space.

What should cause this condition "Low" to obey its peculiar laws? The concentration of the Sun's rays.

What should cause concentration of the Sun's rays, particularly at so great a distance from the Equator, and why should it move as it does? It is easier to explain why it moves, and in other papers (under the "theory of Low") this perhaps has been as satisfactorily explained as it is possible to be. But why the concentration? Some day, with more facts, there may come an explanation; but until then we must accept it as a "first cause." Now that it is so, like many other laws in nature, we can see the beauty of the law establishing it and the wisdom therein; at present it does not seem that we could go further.

The tracks of "Low" (low-barometer) are very eccentric—at times they take directions toward all points of the compass, but as a whole on general lines from the west toward the east or toward the rising Sun. Occasionally, twice this year (1882,) "Low" has retrograded toward the west; this has been during the night. The returning heat in the east the next day soon re-established the current toward the orient. "Low" is the agent of the storm; no "Low"—no storm. "Low" is the centre toward which the wind is drawn; and on its power of concentration depends the force of the winds. People, intelligent people, even those claiming to be meteorologists and writing upon the subject, repeatedly ignore the important factor "Low." An article of this kind recently appeared in one of the leading journals of the country—an article on storms—with not a word about "Low." Hurricanes were produced by the coming together of two currents of wind, a warm and a cold current. Now these two currents cannot come together in any other place or at any other time than when "Low" is passing, or near

the very centre of "Low." As the wind is always toward "Low," it follows that the winds from all quarters must be toward it. North winds which are cold as well as south winds that are hot, and the east and the west winds which combine and partake of the two.

The tornado or the hurricane, call it what you will, for it is all one without regard to name, is the result of "Low" and will always be found in and only in the track of "Low"; and every time "Low" has passed, and is passing over the territory of the United States every three to five days—never regular in time, speed, or direction—always peculiar and irregular in its qualities of concentration, power, speed, spread and direction; every time it passes we are liable to have the fierce storm which we term the tornado or hurricane; and for the reason that it always occurs in the track of "Low" as it passes to the eastward, the Sun being the more powerful in this direction as it not only has the direct power of "Low," but, so to speak, the momentum of "Low" in its course to the eastward. But, it may be said, we sometimes have the tornado with a north wind, which would seem to contradict this; then in the United States it may apparently be so, or locally so, but the power that creates it is the while moving to the eastward. Along the Atlantic sea-board, particularly in the vicinity of Washington, the hurricane will at times occur with a northwest wind for the same general reason that water forming the whirlpool does not travel in a straight line toward the center, if it did there would be no whirlpool. The waters coming with force from every direction act and react upon each other; the result is to establish a circular motion of the currents; so with the winds toward "Low"; they approach "Low" from all points of the compass; their action upon each other establishes a circular motion to the currents. The circle is large, so notwithstanding it may be locally a northwest wind it is really toward the centre, "Low," which has passed the locality to the eastward; and the wind blowing in this manner is what gave rise to the idea that the wind blows, between "High" and "Low," so that if you stand with your right hand toward "Low" and left hand toward "High" the wind will be your face. The wind may in some places be in your face, yet it is all the while seeking the centre "Low"; not in a straight line, but in a grand volute curve.

I may be wrong, but I cannot see wherein the coming together of the so-called warm and cold currents causes the tornado. If the warm and cold currents meet (and they do), they are meeting all the time at the very centre of "Low" and not in the track of "Low" where the tornado takes place; and if they meet all the time it would seem that they should all the time produce the same effect and give us the tornado not only every day but every hour of the day; but we see that they do not—that a great many "Lows" pass over the country without producing a tornado. The tornado occurs late in the afternoon when the Earth has become heated to its maximum point—occurs in warm weather, and seldom if ever in cold, and only with a *high* "Low," or perhaps better, with a "Low" that is traveling on a high line or toward a high line.

August 26, 1881, a hurricane occurred at Charleston, S. C. The "Low"

that caused this storm, at the time not being on a very high line, may seem to oppose this idea, but then it must be remembered that this "Low" came from the south. On the 24th day of August it was reported at St. Thomas. It was therefore at the time seeking a high line, and from present knowledge only under such conditions would it have produced a hurricane in the latitude it did.

A "Low" travelling across the country on the latitude of Charleston I do not think would produce such a storm—it would produce cold, and such a storm requires a vast amount of accumulative force developed by heat which can only be generated, at least in latitudes embracing the United States, by a high "Low" or a "Low" traveling for some distance in a northerly direction.

For years people have been, and are still studying the *effects* of the tornado in its paths of destruction. Many changes are produced, indeed it would be difficult to have a sameness in details, yet with all the general effect is the same every time. There is no light to be obtained by studying the endless variety of detail—it is studying the *effects* and not the *cause*—the cart and not the horse. What we want to study is the cause—the power that creates and not the mere effect that follows. "Low" is the concentration of heat. The tornado is the concentration of that heat to a narrow limit.

A tornado track is never very wide—extended width would prevent its power. Sometimes it is said to be a mile wide, but generally not more than a quarter of a mile or less. For some reason, unknown to us at present, the concentration of the heat is so peculiar as to only effect a narrow track—nature become unbalanced. The tornado is the effort on the part of nature to restore that balance—it is done in the twinkling of an eye. All sorts of plans have been devised whereby to give warning of its occurrence. One might as well during a thunder-storm undertake to give warning of where the lightning will strike. In years to come with more perfect instruments it may be done, but at present it is simply impossible. This is the view of the tornado I would present. Let time prove it or disprove it, it matters not so long as the truth is at least obtained and understood.

In these articles it has been frequently said that "Low" is the agent or factor of the phenomenon, "the storm." Because of this general statement it must not be understood that the phenomenon rain is only the product of the factor "Low"; for meteorology as well as other departments of science has its exceptions, but the exceptions are too often overlooked. Bear in mind that the clouds are all the while being formed everywhere where there is heat and moisture, and that "Low" is simply the agent that gathers them and carries them from point to point to water the Earth. But there are times when the clouds precipitate in the very centre of "High."

This prove that the clouds are being formed everywhere, in "High" as well as in "Low." There are times it is *generally* "High." Under these conditions "Low" is afar off—the clouds the while get heavier and heavier, and when they get sufficiently heavy they precipitate, not waiting for "Low" to come and take them to other localities.

This summer (1882) "High" has prevailed over a very extensive portion of the United States. The result is pleasant summer weather, and although hot, not oppressively so where "High" has reigned. In the northeast where they have been more under the influence of a *high* "Low" it has been hot and dry. In the neighborhood of Washington it has been a most delightful summer and the foliage has remained bright and green, with few or no vermin to destroy the foliage. So the factor "High" it would seem was not favorable to vermin. The question is do they exist the same as during the protracted presence of a *high* "Low"—are they latent the while, or is it necessary to have the presence of "Low" to generate them? This branch of the subject I respectfully refer to the entomologists.

I have spoken of a *high* "Low" etc., I would specially call the readers attention to these expressions. They may seem paradoxical or ludicrous, but if they will pay a little attention to the subject they will readily see the force of the expressions. A *high* "Low" will be "Low" or low-barometer on a high line of latitude, and as the wind blows toward "Low" it follows that under these conditions we will have the wind from the south and therefore it will be very warm. A *low* "Low" will be in effect the reverse of this. A *high* "High" will be "High" on a high line of latitude, which will prevent the south winds from reaching far to the north, therefore the while it will be relatively cool. "High" over us keeps our locality cool; the south winds do not reach us. A *low* "High" will act as a barrier to the south winds—a *high* "High" as a barrier to the north winds. These factors "High" and "Low" in their variety of changes produce the phenomena daily presented to us. Study them well—keep their motion, speed, spread and direction in mind as they follow each other across the country and we will always be well posted, and as well posted as possible for the human mind to be in regard to the conditions of the atmosphere about us. The weather-map, the all important agent whereby we may understand and keep track of the meteorological phenomena of our country, is, in its present shape, quite impractical to those who are beyond its daily reach. If in lieu of, or auxiliary to this, we could have skeleton maps in every office and even in public places throughout the country, and if people would take the necessary, yet *little trouble* to read them, our Weather Bureau might soon become a far more important and popular institution than it is at present. By making it still more of a necessity to the people it would become more and more popular; and worked upon such a basis would soon wield a powerful influence for good.

Let these skeleton maps be of various sizes, small enough even to appear in the columns of a newspaper, and large enough to hang in public places and be seen and read a number of yards away. Have the map of the United States divided into sections of any convenient size. These sections to be designated by letters or numbers or both. In place of the daily "indications" as at present let the office telegraph all over the country the location of "High" and "Low" in such and such squares and on such and such lines, etc. By daylight in the morning every city, town and village from the Atlantic to the Pacific and from

Mexico to Canada could be informed of the situation—of the meteorological conditions of the whole country.

The intelligent people of the world at least will readily become familiar with "High" and "Low," and it will afford them an infinite amount of satisfaction and be most profitable to them to watch and study the changes of nature, and in many ways be of great practical value to them in forewarning and giving them timely notice of the changes that are to occur—and as it were taking them up into a high mountain and showing them the meteorological conditions of the whole country. It would seem that a plan that could easily accomplish this was worth putting into execution. Let this be done and the Weather Bureau will no longer remain in the background with few to do it reverence. Let it once be thus placed in bold-relief before the public and it will take a new lease of life—indeed its past will be very tame and quiet beside what its future will be. The public will then begin to appreciate the work of this Bureau, and will more readily "lend it a hand" and advocate its claims.

Bear in mind, the weather-map is the *geography of the atmosphere*. By it we have been instructed in the factors and phenomena of meteorology as never before. By it we have been brought face to face with the great revelations of nature. Present this map every morning to the eyes of the whole country in a form suitable for practical purposes and the whole country will comprehend its practical value and sound forth its praise.

Only in a skeleton form can it be made thus valuable and universal. Sooner or later this idea must prevail, and when it does the factors and phenomena of meteorology will be more completely revealed, and through this revelation the world will the better be enabled to comprehend the mysteries of nature in this department and the better understand how to derive practical benefit from its meteorological knowledge.

WASHINGTON, D. C., August 26, 1882.

WEATHER PROGNOSTICS

S. A. MAXWELL.

From time immemorial the people of all countries, savage or civilized, have quoted proverbs in relation to the weather whose origin belonged in the dim and distant past.

Some of these can be traced back, and some of them it seems had more than one origin, if we may use such a paradoxical expression—the same proverb being found current coin in the languages of distinct and widely separated races. When this is the case there must be of course more or less truth connected with it. It is customary to accept these weather proverbs as facts, never looking carefully within to see whether truth or falsehood is clothed with their sober garb. It is probable that more than one-half of the trite sayings in regard to the weather are

Washington, D.C.
Nov. 8. '82 -

Dear Doctor

With this mail
I send you some copies -
(Signatures) of last article
on the weather -

"Meteorological Factors and
Phenomena" - published in
the Kansas-City Review
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Very respectfully yours
Irene P. Mayer

